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ABSTRACT

Two experiments investigated to what extent schema activation is involved in any facilitative effect that headings may have on multiple-choice test performance following the reading of a passage. In the first experiment, 1,116 college students read a 1,760-word passage on human sexuality with headings either present or absent. An analysis of the scores on a multiple-choice retention test revealed that the only significant facilitative effect of the headings was in the answering of main-idea retention test questions by subjects with high pre-existing knowledge about the topic, as assessed by a pretest. In the second experiment, 94 college students read a 4,840-word passage on organization in memory with headings either present or absent. In this experiment, those subjects who were enrolled in a college course on human memory were defined as the high pre-existing knowledge subjects. The pattern of significant findings was the same as that reported for the first experiment. Thus, the results suggest that headings facilitate recognition memory for main-idea information by activating relevant prior knowledge. (Seventeen references and two tables of data are appended. (ARH)

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Differential Effects of Headings on High- and Low-Knowledge Readers

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ABSTRACT

Two experiments investigated the effect of headings on memory as a function of the reader's pre-existing knowledge about the passage topic. In Experiment 1, 116 college student subjects read a 1,760-word passage on human sexuality with headings either present or absent. An analysis of the scores on the multiple-choice retention test revealed that the only significant facilitative effect of the headings was in the answering of main-idea retention test questions by subjects with high pre-existing knowledge about the topic, as assessed by a pretest, $p < .05$. In Experiment 2, 94 college student subjects read a 4,840-word passage on organization in memory with headings either present or absent. In this experiment, those subjects who were enrolled in a college course on human memory were defined as the high pre-existing knowledge subjects, and those subjects who had never been enrolled in such a course were defined as the low pre-existing knowledge subjects. The pattern of significant findings was the same as that reported for Experiment 1. Thus, the results suggest that headings facilitate recognition memory for main-idea information by activating relevant prior knowledge.

PROBLEM AND CONCEPTUAL FRAMEWORK

Recent studies (e.g., Dee-Lucas & DiVesta, 1980; Hartley, Kenely, Owen, & Trueman, 1980; Hartley, Morris, & Trueman, 1981; Hartley & Trueman, 1983, 1985; Holley, Dansereau, Evans, Collins, Brooks, & Larson, 1981) have reported facilitative effects of headings on various types of recall performance. These findings have in turn been complemented by results showing a significant positive effect of headings on multiple-choice test performance (Brooks, Dansereau, Spurlin, & Holley, 1983, exp. 1; Wilhite, 1986), suggesting that headings can have a general facilitative effect on memory for expository prose. In their study, Brooks et al. (1983) proposed that headings may facilitate memory by activating schemas relevant to the passage topic, by encouraging the interrelating of concepts in the text, and by providing cues for subsequent retrieval. The present study was designed to investigate to what extent schema activation is in fact involved in any facilitative effect that headings may have on multiple-choice test performance following the reading of a passage.

If headings do encourage memory for passage information by activating schemas as an organizational framework for the encoding of the material (cf. Anderson, Spiro, & Anderson, 1978; Ausubel, 1963, 1968; Bartlett, 1932; Spilich, Vesonder, Chiesi, & Voss, 1979; Voss, 1984; Voss, Vesonder, & Spilich, 1980), then only subjects who possess the relevant schemas,

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as assessed by some measure of pre-existing knowledge about the passage topic, should benefit from the inclusion of headings in the text. If, on the other hand, headings aid multiple-choice test performance primarily by promoting the interrelating of concepts and by providing cues for retrieval of the information, then all subjects should benefit from the inclusion of headings in the text. However, subjects with higher levels of pre-existing knowledge might still be expected to demonstrate a greater benefit from the headings because headings might be more likely to promote the interrelating of concepts in readers with relatively high levels of pre-existing knowledge about the topic.

Also included in the present study was the factor of hierarchical importance of the passage information being tested. Wilhite (1986) included this factor in his experiment and found that the facilitative effect of headings on recognition memory for main-idea and detail information was not significantly different. As a result, he concluded that headings may produce a general enhancement in the availability of both high-level and low-level information in the passage. Thus, it was of interest to determine if the same result could be obtained in a study employing a different prose passage. The factor of hierarchical importance was also included in order to try to determine to what extent this tendency of headings to promote memory for both main-ideas and details might depend on the reader's pre-existing knowledge about the topic. For example, would headings be more likely to promote memory for main-ideas than for details in subjects with high levels of pre-existing knowledge because of the possibly greater ability of these subjects to distinguish between main-idea and detail information in the passage, or would headings be more likely to promote memory for details than for main-ideas in subjects with high levels of pre-existing knowledge because these subjects would tend to be able to encode main-ideas effectively even in the absence of headings?

EXPERIMENT 1

METHODOLOGY

A total of 116 college student subjects read in booklet format a 1,760-word passage on human sexuality from an introductory college psychology text after receiving instructions to read and study the passage in preparation for a later multiple-choice exam on the passage. The passage was divided into eight sections, each consisting of two or three paragraphs. Two versions of the passage were prepared. In one version, the passage appeared with each of the sections of the passage preceded by a heading that consisted of a word or short phrase describing the main topic of the following material. In the other version, the passage appeared with the headings removed. The two versions of the passage were arranged in random order for distribution to subjects. Fifty-five of the subjects read the version of the passage with the headings present, and the remaining 61 subjects read the version of the passage with the headings absent. Prior

to reading the passage, all subjects completed a test of prior knowledge about human sexuality that consisted of eight multiple-choice questions based on low-level detail information from each of the passage segments. After reading the passage, subjects completed a test of vocabulary knowledge before receiving the multiple-choice retention test. The test contained 16 text-based questions, one main-idea question and one detail question from each passage segment. None of the questions from the pre-test were repeated on the retention test.

RESULTS

A 2 X 2 multivariate analysis of covariance was employed in analyzing the data. The two independent variables were pre-existing knowledge group (high pre-existing knowledge and low pre-existing knowledge, based on a median split of pretest scores) and headings group (headings present and headings absent). The two dependent measures were the number of main-idea retention test questions answered correctly, and the number of detail retention test questions answered correctly. The covariate was the score on the vocabulary test. The means from the analysis are shown in Table 1. The interaction of pre-existing knowledge group and headings group was significant, multivariate $F(2, 110) = 4.25$, $p = .017$. Univariate tests revealed that the interaction was significant in the answering of main-idea retention test questions, $F(1, 111) = 7.51$, $p = .007$, but not in the answering of detail retention test questions, $F(1, 111) < 1$. Tukey's test for unconfounded means showed that the effect of headings was significant only for the high pre-existing knowledge group, $p < .05$. That is, the high pre-existing knowledge subjects in the headings-present group performed significantly better on the main-idea retention test items than did the high pre-existing knowledge subjects in the headings-absent group. However, the low pre-existing knowledge subjects in the headings-present group did not perform significantly better on the main-idea retention test items than the low pre-existing knowledge subjects in the headings-absent group.

DISCUSSION

Thus, the results suggest that part of the facilitative effect of headings on recognition memory is due to schema activation and that such an organizational effect of headings is more likely to benefit main-idea information than detail information in a passage. The fact that headings did not significantly affect the performance of the subjects in the low pre-existing knowledge group suggests that other possible influences of headings in terms of promoting the interrelating of concepts and providing retrieval cues (Brooks et al., 1983) did not operate for the subjects with low pre-existing knowledge. This possibility that headings did not encourage the interrelating of concepts and the use of the headings as retrieval cues by the low pre-existing knowledge group is consistent with the assumption that the

effectiveness of headings in promoting these operations is somewhat dependent on the headings successfully activating pre-existing knowledge about the topic. Of possible relevance to this interpretation are findings of Chiesi, Spilich, and Voss (1979) showing that as the number of context sentences preceding the target sentence at input increased, recall of the target sentence by subjects with low pre-existing knowledge about the topic of the sentences declined significantly. These findings have been interpreted by Voss (1984) as suggesting that low-knowledge subjects are not adept at integrating the sentence sequence. Similarly, the results of this experiment suggest that low-knowledge subjects may not be able to use headings as an integrative device with regard to the organization and retention of passage information.

An important methodological consideration in interpreting the results of this study concerns the use of the pretest in assessing the readers' level of pre-existing knowledge about the topic. For example, the pretest might have encouraged the subjects with greater pre-existing knowledge about the topic to use the headings to a greater extent than they would have in the absence of a pretest. To rule out this possibility, an additional experiment was performed in which pre-existing knowledge about the topic to be studied was assessed in a manner independent of the reading of the passage material.

EXPERIMENT 2

METHODOLOGY

A total of 92 college student subjects read in booklet format a 4,840-word passage on organization in memory from a college psychology text on learning and memory after receiving instructions to read and study the passage in preparation for a later multiple-choice exam on the passage. Forty-three of the subjects were recruited from a college course on learning and memory and were therefore defined as the high pre-existing knowledge group. The remaining 51 subjects were recruited from other psychology courses, with the restriction that none of the 51 had ever been enrolled in a college course on learning and memory, and were therefore defined as the low pre-existing knowledge group. The passage was divided into nine sections, which ranged in length from one to nine paragraphs. In one version, the passage appeared with each of the sections of the passage preceded by a heading that consisted of a word or short phrase describing the main topic of the following material. In the other version, the passage appeared with the headings removed. The two versions of the passage were arranged in random order for distribution to subjects. Twenty-four of the high-knowledge subjects read the version of the passage with headings absent, and the remaining 19 high-knowledge subjects read the version of the passage with headings present. Twenty-four of the low-knowledge subjects read the version of the passage with headings absent, and the

remaining 27 low-knowledge subjects read the version of the passage with headings present. After reading the passage, subjects completed a test of vocabulary knowledge and a locus of control measure before receiving the multiple-choice retention test. The test contained 16 text-based questions, one main-idea question and one detail question from eight of the nine passage segments.

RESULTS

A 2 X 2 multivariate analysis of covariance was employed in analyzing the data. The two independent variables were pre-existing knowledge group (high pre-existing knowledge and low pre-existing knowledge, based on college course experience) and headings group (headings present and headings absent). The two dependent measures were the number of main-idea retention test questions answered correctly, and the number of detail retention test questions answered correctly. The covariates were the score on the vocabulary test and the score on the locus of control measure. The means from this analysis are shown in Table 2. The interaction of pre-existing knowledge group and headings group was significant, multivariate $F(2, 87) = 5.63$, $p = .005$. Univariate tests revealed that the interaction was significant in the answering of main-idea retention test questions, $F(1, 88) = 11.38$, $p = .001$, but not in the answering of detail retention test questions, $F(1, 88) < 1$. Tukey's test for unconfounded means showed that the effect of headings was significant only for the high pre-existing knowledge group, $p < .05$. That is, the high pre-existing knowledge subjects in the headings-present group performed significantly better on the main-idea retention test items than did the high pre-existing knowledge subjects in the headings-absent group. Conversely, the low pre-existing knowledge subjects in the headings-absent group performed better on the main-idea retention test items than the low pre-existing knowledge subjects in the headings-present group, but not significantly so.

IMPLICATIONS AND CONCLUSIONS

Thus, the results of Experiment 2 confirm the results of Experiment 1 in a situation in which any potentially distorting effect of a pretest was eliminated. The results of both experiments are consistent with the suggestion that part of the beneficial effect of headings derives from their tendency to activate relevant prior knowledge in the reader and that low-knowledge readers may thus have difficulty in using headings as organizational aids in the comprehension and retention of passage information.

The results of both experiments showed the facilitative effect of the headings to be specific to the main-idea information in the passage segments. Of possible importance to this finding is the relationship between the headings and the content of the passage segments that they precede. The headings employed in these studies highlighted the main topic of the following passage segments and thus may have served to

emphasize differentially the higher level information in the passage segments. In future research, it might be of interest to compare the effects of headings that signal main ideas and headings that signal details. If main-idea headings were found to facilitate performance on main-idea questions only and detail headings were found to facilitate performance on detail questions only, the results would suggest that facilitative effects of headings are very specific in nature. On the other hand, if both types of headings were found to facilitate performance on main-idea questions only, the results would suggest that the facilitative effects of headings involve inducing in the reader a general processing strategy that differentially emphasized higher level information in the passage segments.

Caution is in order in considering possible instructional implications of these findings. In assessing the ineffectiveness of the headings in influencing the performance of low pre-existing knowledge subjects in these studies, it must be remembered that the only type of performance measured was recognition memory. Thus, it is certainly possible that low pre-existing knowledge readers might benefit from the inclusion of headings in the text in other situations in which other aspects of reading and memory performance were assessed. For example, Hartley and his colleagues (Hartley & Burnhill, 1976; Hartley & Trueman, 1985) have found in a number of studies that headings facilitate searching a text for answers to questions. It is certainly conceivable that even low pre-existing knowledge readers would benefit from the inclusion of headings in performing such a search task in which the need to rely on prior knowledge would be minimized.

REFERENCES

Anderson, R. C., Spiro, R. J., & Anderson, M. C. (1978). Schemata as scaffolding for the representation of information in connected discourse. American Educational Research Journal, 15, 433-440.

Ausubel, D. P. (1963). The psychology of meaningful verbal learning. New York: Grune & Stratton.

Ausubel, D. P. (1968). Educational psychology: A cognitive view. New York: Holt, Rinehart & Winston.

Bartlett, F. C. (1932). Remembering. Cambridge, England: University Press.

Brooks, L. W., Dansereau, D. F., Spurlin, J. E., & Holley, C. D. (1983). Effects of headings on text processing. Journal of Educational Psychology, 75, 292-302.

Chiesi, H. L., Spilich, G. J., & Voss, J. F. (1979). Acquisition of domain-related information in relation to high- and low-domain knowledge. Journal of Verbal Learning and Verbal Behavior, 18, 257-274.

Dee-Lucas, D., & DiVesta, F. J. (1980). Learner-generated organizational aids: Effects on learning from text. Journal of Educational Psychology, 72, 304-311.

Hartley, J., & Burnhill, P. (1976). Explorations in space: A critique of the typography of BPS publications. Bulletin of the British Psychological Society, 29, 97-107.

Hartley, J., Kenely, J., Owen, G., & Trueman, M. (1980). The effect of headings on children's recall from prose text. British Journal of Educational Psychology, 50, 304-307.

Hartley, J., Morris, P., & Trueman, M. (1981). Headings in text. Remedial Education, 16, 5-7.

Hartley, J., & Trueman, M. (1983). The effects of headings in text on recall, search and retrieval. British Journal of Educational Psychology, 53, 205-214.

Hartley, J., & Trueman, M. (1985). A research strategy for text designers: The role of headings. Instructional Science, 14, 99-155.

Holley, C. D., Dansereau, D. F., Evans, S. H., Collins, K. W., Brooks, L., & Larson, D. (1981). Utilizing intact and embedded headings as processing aids with nonnarrative text. Contemporary Educational Psychology, 6, 227-236.

Spilich, G. J., Vesonder, G. T., Chiesi, H. L., & Voss, J. F. (1979). Text processing of domain-related information for

individuals with high- and low-domain knowledge. Journal of Verbal Learning and Verbal Behavior, 18, 275-290.

Voss, J. F. (1984). On learning and learning from text. In H. Mandl, N. L. Stein, & T. Trabasso (Eds.), Learning and comprehension of text (pp. 193-212). Hillsdale, NJ: Erlbaum.

Voss, J. F., Vesonder, G. T., & Spilich, G. J. (1980). Text generation and recall by high-knowledge and low-knowledge individuals. Journal of Verbal Learning and Verbal Behavior, 19, 651-667.

Wilhite, S. C. (1986). The relationship of headings, questions, and locus of control to multiple-choice test performance. Journal of Reading Behavior, 18, 23-40.

Table 1

Mean Number of Multiple-choice Questions Answered Correctly, Experiment 1

Pre-existing knowledge group	Headings group	
	Present	Absent
	Main-idea questions	
High		
M	7.24	6.22
SD	.79	1.57
n	28	29
Low		
M	5.67	5.87
SD	1.41	1.54
n	27	32
	Detail questions	
High		
M	5.91	5.94
SD	1.13	1.13
n	28	29
Low		
M	5.34	5.15
SD	1.49	1.73
n	27	32

Note. The maximum possible score was 8. The means shown were adjusted for the effect of the covariate, vocabulary test score.

Table 2

Mean Number of Multiple-choice Questions Answered Correctly, Experiment 2

Pre-existing knowledge group	Headings group	
	Present	Absent
	Main-idea questions	
High		
M	5.78	4.64
SD	1.43	1.91
n	19	24
Low		
M	4.03	4.79
SD	1.23	1.35
n	27	24
	Detail questions	
High		
M	5.91	5.45
SD	1.35	1.37
n	19	24
Low		
M	5.02	4.88
SD	1.53	1.54
n	27	24

Note. The maximum possible score was 8. The means shown were adjusted for the effect of the covariates, vocabulary test score and locus of control score.